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**ENGINEERING DESIGN FILE**Project/Task OU 4-12 RI/FSSubtask Source Term InvestigationEDF Page 1 of 70**TITLE: CFA Landfills I, II, and III; Disposal of Waste Solvents****SUMMARY**

The summary briefly defines the problem or activity to be addressed in the EDF, gives a summary of the activities performed in addressing the problem and states the conclusions, recommendations, or results arrived at from this task.

Attachments 1 through 5 contain information compiled during the OU 4-12 RI/FS. The information consists of letters, reports, and personnel interviews related to disposal of solvents to the landfills.

**Attachment 1:**

Subject: Nonradioactive Waste Solvent Disposal Study  
 Date: April 1971  
 Author: J. C. Commander, Idaho Nuclear Corporation, ANCR-1006  
 Prepared for: U. S. Atomic Energy Commission

**Attachment 2:**

Subject: Safety Appraisal of EG&G Idaho Chemical Disposal Practices  
 Date: June 1980  
 Author: The Industrial Hygiene Section, EG&G Idaho, Inc.  
 Prepared for: EG&G Idaho, Inc.

**Attachment 3:**

Subject: Memo on information related to chromate and boron solutions and morphine use and disposal at NRF. Morpholine was likely used as solvent at NRF.  
 Date: April 1, 1993  
 From: S. H. McCormick, EG&G Idaho, Inc.  
 To: G. J. Stormberg, EG&G Idaho, Inc.

**Attachment 4:**

Subject: Memo of Conversation (Form EG&G-561) on a reference to 120 drums of trichloroethylene potential disposed to CFA Landfill  
 Date: April 5, 1993  
 Interviewer: S. H. McCormick, EG&G Idaho, Inc.  
 Interviewee: Spencer Smith, ICF Technology Inc., Boston, Mass.

**Attachment 5:**

Subject: Memo of Conversation (Form EG&G-561), personnel interview with Dave Dahlquist on past disposal of waste oil, oil filters, solvents, and other shop waste  
 Date: April 14, 1993  
 Interviewer: S. H. McCormick, EG&G Idaho, Inc.  
 Interviewee: Dave Dahlquist, EG&G Idaho, Inc.

Distribution (complete package):

Distribution (summary page only):

Author	Dept.	Reviewed	Date	Approved	Date
<i>S. H. McCormick</i>	<i>WCH</i>				
		EG&G Review	Date	EG&G Approval	Date
		<i>U. W. Watson</i>	<i>9/23/94</i>	<i>TRK</i>	<i>8/26/94</i>



## **Attachment 1**

**Subject:**        *Nonradioactive Waste Solvent Disposal Study*

**Date:**           April 1971

**Author:**        J. C. Commander, Idaho Nuclear Corporation, ANCR-1006

**Prepared for:** U. S. Atomic Energy Commission



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~~D - Dwyer 10-1-93~~

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## J. C. Commander

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NATIONAL REACTOR TESTING STATION

BRAND POLLS BRAND 8249T

PREPARED FOR

**U.S. ATOMIC ENERGY COMMISSION**

HEAD-OPERATIONS OFFICE

UNDER CONTRACT NO. ATUO-11-1230

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NONRADIOACTIVE WASTE SOLVENT  
DISPOSAL STUDY

by

J. C. Commander

IDAHO NUCLEAR CORPORATION  
A JOINTLY OWNED SUBSIDIARY OF  
  
AEROJET GENERAL CORPORATION  
ALLIED CHEMICAL CORPORATION  
PHILLIPS PETROLEUM COMPANY

Date Published,- April 1971

Prepared for  
  
U. S. Atomic Energy Commission  
  
Idaho Operations Office  
  
Under Contract No. AT(10-1)-1230

*This sounds like  
interviews and  
not much more.  
My experience with  
Landfill tells me  
"nominal field  
investigation"  
is nothing  
more*

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much considering  
the area serviced  
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page 1.*

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## ABSTRACT

This report concerns the management of nonradioactive waste solvents generated at the National Reactor Testing Station. Included is a review of applicable regulations and standards, an estimate of the volume and classification of waste solvents generated, a brief description of waste solvent collection and storage techniques and a review of waste solvent disposal alternatives. Cost trade off and environmental impact studies were performed which formed the basis for conclusions and recommendations formulated. The report concludes that: The quantity of waste solvent generated at NRTS (approximately 440 gallons per year) is much less than had been expected; the solvent waste is composed of the sludge from solvent degreasers and the residue paint thinner from paint thinning cascade drums; the solvents are too badly nonradioactive contaminated and low in volume to warrant re-refining; and direct burial or sludge bed drying of the waste solvents provide cost effective environmentally acceptable methods for waste solvent disposal at NRTS. The report recommends that current collection and storage practice be continued and that waste solvents be collected twice a year (in the spring and the fall) for disposal by mixing with solid waste for direct burial in the Central Facilities Area sanitary landfill.

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# NONRADIOACTIVE WASTE SOLVENT DISPOSAL STUDY

## I. INTRODUCTION

Although waste solvents are a relatively small waste stream at the National Reactor Testing Station, disposal of the solvents can be troublesome nevertheless. The problem exists due to the variety of solvent and solute chemical compositions with which one must contend. This study was conducted to determine the scope of the problem in qualitative and quantitative terms and to provide information for a management review of waste solvent disposal system alternatives leading to the selection of an optimized solution.

### 1. STATEMENT OF PROBLEM

Idaho Nuclear Corporation, as a service contractor to AEC-ID, is responsible for the collection and disposal of nonradioactive waste solvents generated at the National Reactor Testing Station. Areas generating waste solvents and which are serviced by INC include CFA, CPP, TRA, NRF, ANL and TAN. Waste solvents and oil have been collected monthly, semiannually or on a call basis; and in the past have been disposed of by dumping and covering or burning in open pits. Currently the oil is being stored for use in the spring and summer months as a surface treatment for dirt roads. A small portion of the waste oil is disposed of by the AEC Fire Department for training of professional firemen and INC's Fire Brigade personnel. Waste solvents are now being collected separately from the waste oil and segregated, since the oil, when mixed with solvent is degraded for other uses. It is therefore desirable to investigate the waste solvent as a product stream; to analyze alternative disposal methods; and to recommend an optimum solution to the problem of nonradioactive waste solvent disposal.

## 2. SCOPE OF STUDY

This study included investigation and analysis in the following areas:

- Applicable Regulations and Standards
- Waste Solvent Generation at NRTS
- Feasibility of Waste Solvent Segregation from Waste Oil
- Nonradioactive Waste Solvent Disposal Alternatives
- Environmental Impact
- Costs of Alternative Disposal Alternatives

## 3. METHOD OF PROCEDURE

This study was conducted emphasizing direct interviews with cognizant Operations personnel, supplemented by a nominal amount of field investigation, and a literature review of available documents. Records of solvent purchases were used to provide a limit on the maximum quantity and types of waste solvents which could be produced at NRTS. Field interviews were conducted with users of solvents to determine the estimated volume of waste solvent generated, storage methods and collection intervals. These inputs were used as a basis for the analysis of disposal alternatives environmental impact and cost studies. The results were then evaluated to provide the basis for the study conclusions and recommendations.

## II. NONRADIOACTIVE WASTE SOLVENTS

### 1. APPLICABLE REGULATIONS AND STANDARDS

The use or disposal of solvents by methods which release vapors or liquids to the environment is subject to numerous Federal Regulations, Executive Orders and Standards which apply to the prevention, control and abatement of air and water pollution at Federal Facilities. The AEC has issued Manual Chapter 0510, Prevention, Control and Abatement of Air and Water Pollution, revised October 13, 1970 which contains documents which apply to AEC facilities such as NRTS. They include:

Executive Order 11507, Prevention, Control and Abatement of  
Air and Water Pollution at Federal Facilities, February 4, 1970.

Executive Order 11514, Protection and Enhancement of Environmental  
Quality, March 5, 1970.

Public Law 91-190, National Environmental Policy Act of 1969,  
January 1, 1970.

Office of Management and Budget Circular A-78, Revised May 18, 1970.

Office of Management and Budget Circular A-81, Revised May 18, 1970.

The Department of Health, Education and Welfare Regulations,  
Title 42 CFR 76.

FWQA CFR Guidelines for Federal Department Agencies and Establishments in the Prevention, Control and Abatement of Water Pollution by Federal Activities.

IAD 0510-22 issued May 28, 1970.

Other Regulations which become applicable when waste solvent is burned in the open, incinerated, used as a fuel, or fuel blend include:

State of Idaho Regulations for Control of Open Burning, Chapter 8.  
Air Quality Criteria for Sulfur Oxides PHS Publication No. 1619,  
dated 1967.

Fuel Standards (Pacific Northwest Region).

Selected Methods for Measurement of Air Pollutants PHS Publication  
No. 999-AP-11, 1965.

The manner in which these various regulations, standards, codes, criteria and rulings affect the disposal of waste solvent will be discussed briefly in the section titled "Nonradioactive Waste Solvent Disposal Alternatives."

## 2. WASTE SOLVENT GENERATION AT NRTS

Records have not been kept of nonradioactive waste solvent generation at NRTS, therefore the types and quantities of waste solvent generated were estimated based upon discussions with solvent users, CFA Site Services Division personnel, and review of solvent use practices at NRTS. The resulting estimate of total waste solvent generated per year was checked against the procurement records of NRTS yearly procurements of solvents. The comparison indicated that a very small percent of the solvent procured is collected as a waste product. Effective March 1, 1971 all NRTS Contractors will be required to report nonradioactive wastes, including waste solvent, and a procedure for documenting these wastes will be prepared. Nuclear and Operational Safety will be responsible for the site-wide reporting of these and all other waste streams.

### 2.1 Type of Waste Solvent

Waste solvents generated at NRTS are made up of residues from solvent cleaning, stripping and degreasing operations. Procurement records were consulted to determine the type and amount of solvent procured during 1970. The resulting data are shown by Table I, Yearly Solvent Requirements at NRTS. Occasionally chemicals for special uses will be procured which will not appear in normal solvent usage, but may show up as a waste material. An example occurred this year when CFA Site Services Division was asked to pick up approximately thirty 55 gallon drums of waste oil from TRA. Of these, fifteen drums contained Dowtherm A, a heat exchanger compound composed 73.5% of diphenyloxide and 26.5% of dipheyl. This chemical was a special order and is not now stocked by the Materiel Division, however it did show up as a waste solvent - which amplifies the need for keeping records and properly identifying waste chemicals.

YEARLY SOLVENT REQUIREMENTS AT NRTS  
(Based Upon 1970 Procurement Records)

TABLE I

<u>CF Cat. No.</u>	<u>Solvent Type</u>	<u>Gals/Yr.</u>
030637	Acetone	*
030493	Benzene	*
030499	Carbon Tetrachloride	*
039343	Chlorothene	40
030505	Ether	*
	Ethylene Glycol	2,750***
110015	Kerosene	123,455**
030035	Methyl Chloroform	1,012
030528	Methyl Isobutyl Ketone	825
030522	Methyl Alcohol	270
031030	Solvent, Hydrocarbon	5,445
	Cleaning, AMSCO P-1	
030037	Solvent, Stoddard	2,346
010148	Thinner, Lacquer	175
019102	Thinner, Lacquer	129
011123	Thinner, Paint or Varnish	205
030050	Trichlorethylene	666
	Total Solvent Usage	134,568

\* Less than 10 Gals/Yr procured

\*\* Includes Kerosene procured for ICPP Calciner Fuel

\*\*\* Antifreeze Coolant, not procured as solvent

## 2.2 Quantities of Waste Solvent

Records have not been kept in the past from which the quantity of waste solvent generated throughout the NMFS could be determined. In lieu of records, solvent users were contacted to determine the generation of waste solvent. The following results were obtained:

### 2.2.1 CFA

Vehicle Maintenance Terminal estimates an annual usage of 350 gallons of Trichlorethylene and 500 gallons of Stoddard solvent for cleaning shop floors. From this application, no solvent is collected as waste, all is evaporated to the atmosphere.

The Heavy Equipment Repair, Electrical, Weld, and Mechanical Service Shops each have solvent degreasing tanks which use Stoddard solvent. These tanks take an initial charge of from 30 to 35 gallons, after which make-up solvent is added periodically to compensate for evaporation losses. Once a year the solvent sludges are drained from the tank sumps for disposal. These waste sludges are estimated to amount to approximately one 55 gallon drum per year.

The service station also uses trichlorethylene and Stoddard solvent for cleaning up grease and oil from floors and equipment. This use of solvent doesn't generate collectable waste since it evaporates to the atmosphere, or is flushed to surface drainage courses with rinse water. Recently, an emulsifier cleaner has been tested and found to be satisfactory for degreasing concrete floors. It is recommended that the emulsifier cleaner be used in all areas rather than organic or chlorinated solvents for cleaning floors.

The Paint Shop uses 175 gallons of lacquer thinner, 129 gallons of lacquer thinner (Nitrocellucose free) and 205 gallons of paint or varnish thinner per year. These thinners are used to clean paint brushes and equipment, with the generation of approximately 180 gallons of waste per year.

2.2.2 TRA Fiscal and Property Control Section indicated that trichlorethylene and Stoddard solvent are used for degreasing purposes, and that the solvents either evaporate to the atmosphere or are absorbed by wipe cloths which are disposed of as solid waste. It was estimated that not more than one or two 55 gallon drums per year of contaminated hydrocarbon solvent might be accumulated per year. During the month of

February 1971, TRA Fiscal and Property Control requested CFA Site Services to collect approximately thirty 55 gallon drums of waste fluids which had accumulated at TRA over the past 10 or 12 years. These fluids were unclassified, however it was determined by inspection that 6 drums contained waste lubrication oil from the crankcases of diesels and Clark compressors, 4 drums contained semisolid sludges of oil, water and caustic, and the remainder contained Dowtherm A, a heat exchange media which is no longer used at TRA or stocked by CFA stores. Disposal of these drums of waste fluid created a problem which was magnified due to the lack of pertinent information regarding the composition of the waste fluid and approved methods for its disposal. Establishment of management rules for recording and identifying waste streams such as these will minimize future liquid waste disposal problems.

#### 2.2.3 ICPP

The ICPP uses approximately 550 gallons per year of Methyl Isobutyl Ketone in the second and third solvent extraction cycles. This material is recycled and make up solvent added as necessary. There is no waste solvent generated by this process.

Most of the 123,000 gallons of kerosene purchased by NRTS is used for fueling the ICPP Calciner, and although some kerosene might be used as a solvent there are no indications that waste kerosene is generated for off-site disposal. ICPP uses AMSCO 125-90W Hydrocarbon cleaning solvent which is essentially a very high grade kerosene to scrub objectional residual phosphates from the aqueous product of the uranium recovery system. The contaminated AMSCO is run through a packed stripping column and then burned in a waste solvent burner at a rate of 10 liters per hour.

It appears that little if any nonradioactive waste solvent is generated at ICPP.

#### 2.2.4 TAN

Solvents used at TAN include 600 gallons per year of Stoddard solvent, 115 gallons per year of Acetone and 370 gallons per year of trichlorethylene. The solvents are used in degreasing operations and are lost to the atmosphere by evaporation. Waste solvents from the decontamination rooms are flushed to hot waste collection drains and

processed through the TAN hot waste evaporator or sent to ICPP for processing. No waste solvents are generated for collection and off site disposal.

#### 2.2.5 ANL

No nonradioactive waste solvent is generated by normal yearly operations of ANL.

#### 2.2.6 NRF

Westinghouse Electric deferred discussion of waste solvents with deference to their customer, however information was obtained from the AEC which indicated that less than two 55 gallon drums of non-radioactive waste solvent per year could be expected from NRF.

#### 2.2.7 Summary

It appears that the total NRTS generation of waste solvents is in the order of 440 gallons per year. These wastes are not true solvents but instead are comprised of sludges of petroleum, paint and other extraneous materials which have collected in solvent baths over a period of time. These wastes will no longer have the physical or chemical properties of the virgin solvent, and therefore will be difficult to identify accurately

### 3. COLLECTION AND STORAGE PRACTICE

#### 3.1 Collection of Waste Solvents

Waste solvents or solvent sludges are collected by the Site Services Division on an "as called" basis. In the past, waste solvent sludges were collected concurrently with the collection of waste oil, and no attempt was made to segregate the solvents and sludges from the waste oil. Current collection practice is in the process of being revised in order that waste oil can be stored separately for use as road oil. This revised practice will require that solvents, paint thinners, and waste sludges be collected separately and kept segregated for eventual disposal. Collection operations will take two men, one fork lift, a lowboy trailer and a tractor for large collections. Small 55-gallon drum lots could be collected using a pickup truck and fork lift. Since labor and equipment rental time records are not maintained separately for these collection functions, cost figures will be based upon best estimates from the responsible organization for labor and equipment usage.

### 3.2 Containment and Storage Procedure

Waste solvents and solvent sludges are now held at the point of generation in 55 gallon drums pending collection by the Site Services Division.

Temporary storage of flammable wastes in 55 gallon drums on external slabs or pallets is in accordance with NFPA recommended practices which states "Crankcase drainings and flammable or combustible liquids shall not be dumped into sewers, but shall be stored in tanks or tight drums, outside of any building until removed from the premises." (1) The anticipated volume of waste solvents and solvent sludges to be generated per year, 440 gallons doesn't warrant procurement or construction of special storage facilities.

### III. NONRADIOACTIVE WASTE SOLVENT DISPOSAL ALTERNATIVES

Solvents are generally expensive enough to warrant the reclamation of the solvent by filtration and distillation. Plants which use large amounts of solvent in the process i.e. degreasing, dyeing, surface coating and dry cleaning operations, usually have solvent reclamation equipment designed into the process. Solvents used at NRTS range in price from \$0.23 per gallon for kerosene in 55 gallon drums to \$8.75 per gallon for carbon tetrachloride in one quart bottles, and they are not normally lost as liquid waste streams but by evaporation. Excluding kerosene and AMSCO, which is used almost exclusively in the fuel recovery process at ICPP, about 5,700 gallons of solvent are used per year at NRTS. Of this amount less than 10% is wasted as solvent sludge. These sludges are so heavily contaminated with foreign matter that less than 50% by weight of solvent remains in the sludge as waste. Therefore when considering waste solvent disposal alternatives, one must also consider the solute disposal options. At NRTS, these waste sludges will consist of oil, grease, paint and lacquer residue, and emulsions of these with solvents. In view of the volume of solvent waste and its degree of contamination, disposal alternatives are limited to direct burial, incineration, encapsulation and burial, or biodegradation in sludge drying beds. Large quantities of specific liquid wastes such as Dowtherm A should be analyzed on an individual basis as will be done here. Disposal alternatives which will be considered for Dowtherm A will include commercial reclamation, in addition to those specified for solvent sludge disposal.

#### 1. COMMERCIAL RECLAMATION

Dow Chemical was contacted regarding reclamation of approximately twenty 55 gallon drums of Dowtherm A, a heat exchange compound composed of 73.5% diphenyloxide and 26.5% diphenyl. Dow Chemical expressed interest in the material for reclamation until it was determined by Nuclear and Operational Safety that the drums were contaminated with alcohols and chlorinated solvents. Dow then agreed to accept the contaminated Dowtherm A at their Midland, Michigan plant for safe incineration at no cost to the Government except for redrumming and

shipping to their Midland, Michigan Plant. The annual generation of contaminated solvents from NRTS was discussed with Dow Chemical, Standard Oil Company of California and American Mineral Spirits. These companies expressed no interest in the waste solvent sludges due to the small quantity involved and the high percent of impurities in the waste. Based upon this response commercial reclamation of NRTS waste solvents is considered impractical.

## 2. DIRECT BURIAL

Precedent has been established in the Health Education and Welfare Use Criteria for Sanitary Landfills for direct burial of waste oils, solvents or other potentially hazardous liquids.<sup>(2)</sup> The criteria allows such liquid to be mixed with the solid waste and compacted in the landfill. This practice is however restricted to landfill sites which are protected from surface runoff and where safe limitations exist with respect to the potential radiou of percolation.

At NRTS, waste solvents to be buried should be collected during the spring and fall (at 6-month intervals) and transported to the sanitary landfill. The wastes should be spread upon the day's collection of solid wastes, compacted, and covered with at least one foot of natural soil cover. Although the solvent sludges are not expected to contain much volatile residue, fire protection men and equipment from the AEC Fire Department should be ready at the site to immediately extinguish a fire should one be initiated by the compaction equipment. As an added precaution, the dozer operator should wear a charcoal filter respirator during the compaction and cover operations. These precautions will insure the safety of the equipment operator in the event of a highly unlikely ignition of volatile fumes by the compaction equipment.

## 3. INCINERATION OF WASTE SOLVENTS

Liquid waste incinerators are available which could incinerate NRTS Waste Solvents safely.<sup>(3)</sup> The Prencó-Pyro-Decomposition System will combust flammable mixtures of organic solvents and sludges without air or stream pollution and without hazard.

Rohn and Hass Company also has designed an incinerator capable of incinerating 450 gallons per hour of nonuniform organic wastes with

specific gravities in the range of 0.8 to 1.05, viscosities in the range of 29 S.S.U. to 3,000 S.S.U. at 75°F and water content by weight in the range of 0 to 75%. These systems all use supplementary fuel to bring combustion chambers up to initial operating temperature and to add heat where necessary for high water content liquid waste. These systems would be able to dispose of the waste solvent sludges generated at NRTS in less than 8 hours per year of operation. The smallest industrial liquid waste incinerator now on the market can process organic wastes at a rate of 20 gallons per hour. An industrial incinerator this size would have to operate only 22 hours to process the 440 gallons of NRTS solvent sludges generated per year.

The waste stock of Dowtherm A (approximately 1000 gallons) could also be combusted in a 20 gallon per hour industrial liquid waste incinerator in about two weeks of single shift operation. A high proportion of auxiliary fuel (kerosene or No. 2 fuel oil) would be required to maintain the autoignition temperature of 621°C required to insure complete combustion of the Dowtherm A.

#### 4. ENCAPSULATION AND BURIAL

Oak Ridge National Laboratory, among others, has developed a process for incorporating radioactive organic solvents in asphalt or plastics for burial as immobilized or encapsulated waste.<sup>(4)</sup> This process can be used to immobilize NRTS waste solvent sludges after which they could be buried in the CFA Sanitary Landfill. Leach rates of 1.1% per year with the product completely immersed in water have been obtained. The ORNL pilot plant used to develop the process is adequately sized to treat NRTS nonradioactive solvents, sludges and will be used as a basis for developing cost estimates.

#### 5. DISPOSAL IN SLUDGE DRYING BEDS

Solvent sludges can be collected during the winter months and deposited in impermeable beds during the summer months. Volatile solvent remaining in the sludges will quickly evaporate to the atmosphere leaving organic residues which when dried out can be scraped from the bed and disposed of in a sanitary landfill. Sludge bed dimensions required to accommodate the yearly accumulation of waste

solvent sludges will be based upon a sludge layer of not to exceed six inches. Based upon a volume of 500 gallons per year, the bed would need to have 60 cubic feet of capacity. Therefore a bed 4 feet wide by 30 feet long by 6 inches deep would be suitable. The bed should be constructed of concrete or in the form of a shallow trench lined with an impervious clay liner.

#### IV. ENVIRONMENTAL IMPACT

Hydrocarbons and their derivatives are important factors in air pollution problems because of their ability as aerosols to participate in the atmospheric reactions that produce effects associated with photochemical smog<sup>(5)</sup>, and as liquids to flush from the ground to ultimately pollute streams or ground water supplies. It is important therefore that the proposals for waste solvent disposal be analyzed for environmental impact. The alternative processing or disposal methods which will be analyzed include: commercial reclamation, direct burial, incineration, encapsulation and burial and sludge drying beds.

##### 1. ENVIRONMENTAL SETTING: GEOGRAPHY, GEOLOGY AND HYDROLOGY

###### 1.1 Geography

The National Reactor Testing Station (NRTS) is located on the north side of the Snake River Plain at 4,800 to 5,000 feet elevation. Basin and range type mountains rise to above 12,000 feet elevation on the northern, eastern and southern borders of the Plain. The area has a high desert climate with less than 10 inches of precipitation per year. The prevailing winds are generally from the southwest but secondary winds come from the northwest, either channeled down mountain valleys or as cold air drainage from the mountains.

###### 1.2 Local Geology

The area of interest, Central Facilities Area (CFA), lies over Lost River deposited gravels that are 30 to 40 feet in depth.<sup>(6)</sup> The ground surface is essentially flat with a gentle northward slope. The present Lost River is a much smaller stream than it was when the gravels were deposited. The gravels show cut and fill structure typical of deposits formed on the flood plain of a swollen, braided stream. Geological evidence indicates that the ancestral Lost River was swollen by glacial melt water, and that it meandered over a broad plain which was about 5 miles wide at CFA.

The Lost River gravels overlie a thick permeable sequence of Snake River basalt. These basalts were deposited in a down-warped or down-faulted basin and may be in excess of 5,000 feet thick.<sup>(7) (8) (9)</sup> The basalt sequence was deposited over several million years. Periods of

volcanic activity are recorded in the stratigraphic record as basalt flows. Between volcanic periods deposition of soil occurred and are recorded in the stratigraphic record as sedimentary interbeds between basalt flows.

### 1.3 Hydrology

The regional water table is about 460 feet below the land surface in the Snake River basalt. Local sedimentary interbeds of impermeable basalt flows cause perched water above the regional water table.<sup>(10)</sup> Most of the basalt is fairly permeable having 5 to 10% permeable open void space.<sup>(11)</sup> Below the water table all permeable space is filled with water of the Snake River Aquifer; above the water table interconnected permeable openings are filled with air and constitute aerifers. The air in the aerifers is not static as it flows and changes with fluxuations in the surface barometric pressure.<sup>(12)</sup> The water in the aquifer moves south to southwest down the regional gradient at about 3,000 to 5,000 feet per year.<sup>(13)</sup>

Surface water occurs at CFA only during cloudbursts or periods of melting snow. Existing flood control works have been installed to protect CFA and channel surface runoff away from potential waste solvent disposal facilities

## 2. COMMERCIAL RECLAMATION

Rerefining of waste solvent is a very effective means for conserving solvent and minimizing the danger of pollution. In the rerefining process, dirt, water and other contaminants are removed; and by selective distillation or vacuum fractionation the solvent is restored to the same range of properties as the original solvent. In this process the solvent is saved with little or no discharge of pollutants to the environment. From an environmental and conservation standpoint commercial reclamation of used solvent is the most desirable approach to waste solvent disposal. Most solvent users include some form of solvent reclamation system in their process, since 90% of solvents are otherwise lost to the atmosphere. The solvent sludges remaining from degreasing, dry cleaning, painting, coating and similar operations are normally so badly polluted that they cannot be economically reclaimed. This is the case with the NRTS waste solvents.

### 3. DIRECT BURIAL

Direct burial of waste oils, solvents or other potentially hazardous liquids is not normally an accepted practice except where no possibility exists for contamination of water supplies.<sup>(a)</sup> However where the pollutant liquid can be reasonably expected to be retained in the landfill, and the ground water table is separated from the waste by impervious strata or by great depths of pervious material, some relaxation of this practice is acceptable. Field percolation studies for the State of California Water Quality Control Board determined that 320 gallons of water were required to saturate 8.1 cubic yards of compacted domestic rubbish.<sup>(14)</sup> It follows that rubbish compacted in a sanitary landfill can be expected to have a moisture retention ability of about 40 gallons per cubic yard of waste. On this basis limited amounts of contaminated liquids could be mixed with rubbish and retained with the fill until biodegradation of the waste had been accomplished. Based upon a maximum generation of 440 gallons per year of contaminated sludge solvents, it would take only ten cubic yards of solid waste to adsorb the liquid and retain it within the fill. This solution to disposal of nominal amounts of nonradioactive waste liquids is additionally supported by U. S. Geological Survey reports which conclude that shallow ground disposal works at NRTS would provide several natural safeguards to the water supplies due to: (1) Ionic exchange or adsorption of contaminants by sediments and rocks through which the liquid percolates; (2) lateral dispersion of the percolating liquid above the zone of saturation would assure some dilution of contaminants that might reach the water table; (3) time lag before percolating liquid reached the water table (which is about 500 feet beneath the land surface) would allow partial or total reduction of contaminants before they reached the zone of saturation; (4) particulate matter would be partly or wholly filtered out of liquid passing through the sediments.

### 4. INCINERATION OF WASTE SOLVENTS

Disposal of waste solvent sludges by incineration is an accepted practice if the sludges are burned in an incinerator designed to provide complete combustion of the solvent and sludge residues. Solvents, paints

(a) Reference (2) Page VI-2.

and oils normally making up the waste solvent sludges can be converted to carbon dioxide ( $\text{CO}_2$ ) and water vapor ( $\text{H}_2\text{O}$ ) which can be exhausted directly to the atmosphere. Nonflammable solvents such as carbon tetrachloride must be accounted for and are not disposed of as waste solvent. Dowtherm A can also be incinerated by commercially available high-temperature incinerators which can insure complete decomposition and oxidation of the diphenyl and diphenyloxide mixture, emitting  $\text{CO}_2$  and  $\text{H}_2\text{O}$ . Large quantities of organic liquids not included in this study should be analyzed on an individual basis before approval to incinerate is requested.

#### 5. ENCAPSULATION AND BURIAL

A large variety of radioactive contaminated liquid waste residues has been incorporated in asphalt and/or polyethylene - a relatively cheap and impervious media. Wastes so encapsulated have very low leach rates in water, emit little or no odor and can be safely buried.<sup>(a)</sup> NRTS waste solvent sludges so encapsulated could be disposed of in the CFA sanitary landfill as normal solid waste with no detrimental effect to the environment.

#### 6. DISPOSAL IN SLUDGE DRYING

Hydrocarbons, chlorinated hydrocarbons and their derivatives constitute most of the solvents used at NRTS. The major portion of these solvents, 90% by weight are dissipated to the atmosphere during use and never are collected as waste solvent. The remaining 10% is highly contaminated with paint, oil, grease, dirt and water. These solvent sludges could be placed in drying beds to allow residual solvents to dissipate to the atmosphere in the way that the solvent loss occurs during usage. The olefins (unsaturated hydrocarbons), paraffins (saturated hydrocarbons and aromatic hydrocarbons) and hydrocarbon derivatives such as aldehydes, ketones and chlorinated hydrocarbons so dispersed can react with nitrogen dioxide in the atmosphere to produce eye irritation aerosols and ozone. In addition some of these are rather toxic, however the dilution rate to the atmosphere at NRTS will prevent this from being a problem on the desert. The solvent so dissipated, less than 900 pounds per disposal cycle, is so small an amount that its presence in the air could not be measured 100 yards

(a) Reference (4)

distant from the drying bed. The dry hydrocarbon residue of tar and paint pigments can be periodically scrapped from the drying beds and disposed of safely at the CFA sanitary landfill.

## V. COST COMPARISON

In view of the low volume of waste solvent sludges generated at NRTS, approximately eight 55 gallon drums per year, it has been assumed that the cost of storage, collection and transportation will be essentially equivalent for all waste solvent disposal systems analyzed. Therefore, the costs developed here will include only those costs associated with the disposal of the waste solvent after its delivery to the disposal site. Solvent disposal systems compared include: Commercial reclamation; direct burial; incineration; encapsulation followed by burial; and sludge drying beds.

### 1. COMMERCIAL RECLAMATION

Contact with solvent producers concerning their interest in reclaiming waste solvent has resulted in discouraging responses. Dow Chemical, American Mineral Spirits Company (AMSCO) and Standard Oil of California were contacted regarding waste solvent reclamation and in all cases, the response was negative. Dow Chemical did express interest in some twenty 55 gallon drums of used Dowtherm A heat exchanger fluid however sample tests indicated the fluid was too badly contaminated for reprocessing. The company will accept the fluid for incineration at their Midland, Michigan Plant. Reclaiming of waste solvent at NRTS will require the construction and operation of a solvent rerefining installation which would consist of a settling tank, preheater, pot still and fractionating column, surface condenser, and dehydrating tank. Assuming reclamation of a 300-gallon batch twice a year with a 50% recovery factor, the cost per gallon of reclaimed solvent would equal \$1.82 per gallon and would require a capital investment of \$5,100.

### 2. DIRECT BURIAL

Costs for the direct burial of waste solvents are based upon using the CFA sanitary landfill as a disposal ground. Since the landfill is operational, no facility costs will be incurred, nor will the compaction and cover operations vary from normal. The additional costs chargeable to direct burial of the solvent wastes include the cost of spreading the waste solvent, of providing fire protection and of providing clean respirators for the equipment operators. This amounts to \$0.47 per gallon of waste and requires no capital investment.

### 3. INCINERATION OF WASTE SOLVENT

Two incineration options were considered; the first, incineration at a new incineration facility designed to accommodate 25 gallons per hour; and the second, incineration at the ICPP waste kerosene burner. The cost of design and construction of a new incineration facility will equal approximately \$14,400. Assuming straight line depreciation over a 10-year life, this amounts to a cost of \$1,440 per year. Operating expenses will be about \$210 per year for a total cost of \$1,650 per year. This would be equivalent to a disposal cost of \$3.75 per gallon.

The ICPP waste kerosene burner will not accept sludge solvents because of the gummy nature of the sludge and the varying density of the solvent residues. In order to use the system, a separate fuel storage tank, sludge burner and heater would be required. These modifications would cost approximately \$7,350 prorated over a 10-year life. The operating expense would be \$1,580 per year, for a total cost of \$2,315 per year, which is equivalent to a disposal cost of \$5.26 per gallon.

### 4. ENCAPSULATION AND BURIAL

The laboratory-scale encapsulation process developed at ORNL was used as a cost model for determination of facility cost. Waste solvent can be processed at a rate of 7.25 gallons per hour, asphalt fuel rate at 4.02 gallons per hour and product rate 4.18 gallons per hour. The system uses a wiped film evaporator which will evaporate volatiles to the atmosphere leaving the solids in the sludge to be encapsulated. The cost of design and construction of an encapsulation facility will equal about \$58,400. Assuming straight line depreciation over a 10-year life, this amounts to a cost of \$5,840 per year. Operating expenses will be about \$1,090 per year, for a total cost of \$6,930 per year. This would be equivalent to a disposal cost of \$16.50 per gallon.

### 5. SLUDGE DRYING BEDS

Cost for disposal of solvent sludges in sludge drying beds includes the cost of sludge beds, spreading sludge, removing dried sludge and burial of sludge at CFA sanitary landfill. The cost of sludge beds will equal about \$200 and the operating costs will be about \$167 a year. The total cost per year based on one year life of sludge drying beds will be \$367 per year or about \$0.84 per gallon of waste solvent.

## 6. COST SUMMARY

The results of the NRTS nonradioactive waste solvent disposal cost comparison is shown by Table 2. Disposal by direct burial at the CFA sanitary landfill proves to be the most cost effective option, and will not require an investment of capital dollars. Encapsulation of waste solvent sludges is the most expensive alternative and could not be considered for disposal of nonradioactive wastes. The method could be considered for disposal of radioactive liquid wastes contaminated with chloride ion above acceptable levels for processing by the ICPP calciner.

TABLE 2

Disposal Method	Capital Costs in \$	Total Operating Cost \$/yr	Cost/Gal in \$/Gal	Δ Cost per Year
Note (1)				
Commercial Recl. at NRTS	\$5,100	\$870	\$ 1.82	\$ 664.00
Direct Burial	0	206	0.47	0
Incineration				
Option 1 New Facility	14,400	1,650	3.75	1,444.00
Option 2 ICPP	7,350	2,315	5.26	2,109.00
Encapsulation and Burial	58,400	6,930	16.50	6,724.00
Sludge Drying Beds	200	367	0.84	161.00

Note (1) See Appendix for Cost Analysis Calculation

#### Cost Comparison

#### NRTS WASTE SOLVENT DISPOSAL OPTIONS

## VI. CONCLUSIONS AND RECOMMENDATIONS

The principles of environmental protection and resource conservation demand that waste streams from residential, commercial, industrial and Government operations be evaluated for harmful content and residual value prior to the arbitrary discharge of the crude waste stream to the environment. Adherence to these principles provided the impetus for this non-radioactive waste solvent disposal study and the conclusions and recommendations which are now presented.

### 1. CONCLUSIONS

The investigation of NRTS generated nonradioactive waste solvents produced the following conclusions:

- 1.1 Approximately eight 55 gallon drums or 440 gallons of waste solvent sludges are generated each year at NRTS. These sludges consist of bottoms from solvent degreasers and the residuals from paint equipment cleaning cascades.
- 1.2 Collection and interim storage of these waste sludges in 55 gallon drums is the current practice at NRTS, which is compatible with NFPA recommended practice.
- 1.3 The solvent sludges in the past, have been mixed with waste oil in the 10,000 gallon waste oil storage tank. This practice should be discontinued as the solvents render the waste oil unsuitable for use as road oil.
- 1.4 NRTS nonradioactive waste solvents can be disposed of by rerefining, direct burial, incineration, encapsulation in asphalt or by sludge drying with no adverse effect on the environment.
- 1.5 The low volume of waste solvent generated at NRTS doesn't warrant the construction or rerefining, incineration or encapsulation facilities due to the high cost of disposal operations associated with those alternatives.
- 1.6 Disposal of waste solvent sludges by direct burial in the CFA sanitary landfill or by sludge drying followed by burial are both cost effective alternative methods for waste solvent sludge disposal.

1.7 Special, nonroutine waste solutions (such as the twenty 55 gallon drums of Dowtherm A which were recently collected from TRA by INC) cannot be classified as waste solvents. They should be considered on an individual basis since acceptable disposal alternatives will vary depending upon the chemical composition of the waste fluid.

## 2. RECOMMENDATIONS

Analysis of the information generated during the study resulted in the following recommendations:

2.1 Continue the current practice of collecting and storing waste solvent sludges in 55 gallon drums. Solvent disposal operations should be scheduled twice a year, once in the spring and the fall, to prevent accumulation of large quantities of waste solvent sludges.

2.2 Plan to dispose of the waste solvent sludges by adding the waste sludge to the day's collection of solid waste at the CFA sanitary landfill, then using the compaction equipment to mix, compact and cover the waste in accordance with standard sanitary landfill procedures.

2.3 Arrange for the NRTS Fire Department to stand by with a tanker and pump during the disposal operation as a safeguard against spontaneous combustion of the mixed waste during the compaction activities.

2.4 Maintain accurate records of solvent wastes collected, including source and makeup. Abnormal collections in terms of volume and constituents should be reviewed for compliance with safety and pollution control standards prior to processing the waste. A sample Report Form, Figure 1, is presented for review by the Nuclear Operations and Safety Division of Idaho Nuclear Corporation.

Form ID-\_\_\_\_\_

U. S. ATOMIC ENERGY COMMISSION

IDAHO OPERATIONS OFFICE

Reference

IDM \_\_\_\_\_

Nonradioactive Waste Oil or Solvent Report

1. Waste Oil or Solvent Report for _____ Plant Area or Facility _____	2. Report Period From _____ To _____	3. Prepared by _____ Approved by _____
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4.	5.	6.	7.	8.	9.
Identification	Quantity in Gal.	Container	Collection Method	Disposal Method	Remarks

Total

Sample Report Form  
Figure 1

## References:

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3. Stern, Arthur C., Air Pollution, Volume III 1968, Page 21.
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6. Well Logs and Test Boring Logs from INC Construction Engineering Files.
7. Walker, E. H., 1964, Subsurface Biology of the National Reactor Testing Station, Idaho, U.S. Geological Survey Bulletin No. 1133-B.
8. Hill, D. P., 1963, Gravity and Crustal Structure in the Western Snake River Plain, Idaho, Journal of Geophysical Research, Volume 68, No. 20, Pages 5807-5818.
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10. Original Driller's Log of CFA, No. 4 Seepage Well in INC Construction Engineering Division Files.
11. Niccum, M. R., 1969, Geology and Permeable Structures in Basalts of the East Central Snake River Plain near Atomic City, Idaho, Unpublished Thesis. Idaho State University, Pocatello, Idaho.
12. Barraclough, J. T., et al, 1967, Hydrology of the National Reactor Testing Station, Idaho in 1965, February 1967, IDO 22048, Pages 90-94.
13. Barraclough, J.T., et al, 1968, Hydrology of the National Reactor Testing Station, Idaho in 1966, USGS Open File, Report Issued October 1967, TID 4500, Pages 70-71.
14. "Investigation of Leaching of a Sanitary Landfill", California State Water Pollution Control Board Publication No. 10, 1954, Mertz.

COST OF SOLVENT RECLAMATION AT NRTSSolvent Rerefining Installation

Assume installation at CPP with all required utilities (water, power, waste disposal and steam) available. Use existing Building T-15 at CPP.

Settling Tank - 300 gallons at \$2/gal.	= \$600.00	
Preheater 30 gallons/ hr	= 200.00	
Pot Still 30 gallons/hr	= 500.00	
Fractionating Column 15 gallon/hr at \$20/ gal.	= 300.00	
Surface Condenser 15 gallon/hr	= 150.00	
Dehydrating Tank 15 gallon/hr @ \$5/gallon	= <u>75.00</u>	
		\$1,825
Pumps, valves and piping 40% of 1,825		730
Instrumentation and Controls 10% of 1825		<u>180</u>
		\$2,735
Indirects 25% of \$2,735		680
ED&I 20% of \$3,415		680
Contingency 25% of \$4,095		<u>\$1,010</u>
		<u>\$5,105</u>
Say \$5,100		

Operation:

10 hours/ day, 2 days/ year	= 20 hours	
2 operators x 20 hours x \$9.00/hr	= \$360/Yr	
Facility over 10 years	= <u>\$510/Yr.</u>	
Yearly Cost	\$870/Yr.	
Less Reclaimed solvent 220 gallons @ 30¢/gal	= <u>\$66/Yr.</u>	
	Say <u>800/Yr.</u>	
Cost/ Gallon based on disposal of 440 gallons/Yr = 800/440	= \$1.82 /gal.	

COST OF DIRECT BURIAL OF SOLVENT AT CFA  
SANITARY LANDFILL

Assumptions:

Waste solvent collected twice a year and 300 gallons of sludge solvent is spread over the day's accumulation of waste. Fire Department Personnel and Water Pumper will be on hand during spreading and compacting operations.

Spreading Operations

Labor 2 men x 2 hr x 2/yr x \$9.00/Hr	= \$72.00/yr
Equipment - Truck 2 hr x 2/yr x \$4.50/hr	= 18.00/yr
Forklift 2 hr x 2/yr x \$3.00	= <u>12.00/yr</u>
	\$102.00

Fire Department Personnel

Labor 3 men x 2 hr x 2/yr x \$4.00/hr	= \$36.00
Equipment - Pumper 2 hr x 2 yr x \$17/hr	<u>68.00</u>
	\$104.00

Total Cost/ Yr = 206.00

Cost per gallon based on disposal of 440 gal/yr =  $\frac{\$206}{440} = \$ 0.47/\text{gal.}$

# INCINERATION OF WASTE SOLVENT

Option #1. New incineration facility with 25 gallon per hour capacity, operated twice a year for a total of 440 gallons/ 25 = 17.5 hours. (8.8 hours per operating period.) 2 hours per day required for startup and shut down therefore 6 hours per day of operation are available from an 8-hour day.

$$2 \times 8.8 \times \frac{8}{6} \times \$9.00/\text{hr} = \$210.00/\text{yr}$$

## Facility Cost

1. Furnace 25 gallon/hour w/liner	\$2,500	
1 Auxiliary Fuel System	1,000	
2 Waste solvent Pump and Motors	200	
1 300 gallon Storage Tank	600	
1 Set Controls	180	
2 Blowers 600 SCFM	<u>1,000</u>	
		= \$ 5,480
Piping and Valves 40% of \$5,480		= 2,180
Indirects 25% of \$7,660		= 1,920
ED&I 20% of \$9,580		= 1,920
Contingency 25% of 11,500		= <u>2,870</u>
		\$14,370

Assume 10 year life

Facility cost/ year	=	\$1,440/ Yr
Cost of Labor		<u>210/Yr</u>
Total		\$1,650/Yr

$$\text{Cost per gallon based on disposal of 440 gallons/year} = \$3.75/\text{gal}$$

# INCINERATION OF WASTE SOLVENT

Option #2. Use ICPP Waste Kerosene burner with necessary modifications.  
 Burner rates 2.5 gallon/ hour. Use kerosene as auxiliary fuel. Manual  
 start, auto operation and shut down.

## Required Modifications

New -	300 gallon storage tank	-	\$600	
	Separate manifolding and pumps	-	200	
	New heavy duty burner		1,000	
	Heater for sludge		500	
1-	Add Blowers		<u>500</u>	
				\$2,800
	Piping and Valves 40% of 2,800	=	1,120	
	Indirects 25% of 3,920	=	980	
	ED&I 20% of 4,900	=	980	
	Contingency 25% of 5,880	=	<u>1,470</u>	
	Total			\$7,350

Labor 440 gallons at 2.5 gallons/hour = 176 hours  
 1 man x 176 hours x \$9.00 = \$1,580/yr  
 Based on 10 year life, Fac. Cost/ Yr = 735/Yr  
 Total Operating Cont. = \$2,315/Yr

Cost per gallon based on disposal of 440 gallons/year = \$5.26/gal

# COST OF ENCAPSULATION AND BURIAL

## Facility

Asphalt Storage Tank	750 gallons	= \$2,500	
Asphalt Feed Tank	75 gallons	= 500	
Wiped Film Evaporator	4 ' surface	= 7,600	
Variable Drive M.G. Set		= 4,000	
Condenser		= 300	
Waste Feed Tank 120 Gallons		= 1,500	
Pumps - 3 Units		= 3,000	
Valves and Piping 40% of 19,400		= 7,800	
Instrumentation 20% of 19,400		= <u>3,900</u>	
			\$31,100
Indirects 25% of 31,100			7,800
ED&I 20% of 38,900			7,800
Contingency 25% of 46,700			<u>11,700</u>
Total			\$58,400

## Operation

Asphalt - 4.02 gal/hr x 58 h x \$.20/gal = \$47/yr  
 420 gallons at 7.25 gal/hr = 58 hr

2 Operators x 58 hr x \$9.00/hr = \$1,040/yr

Facility Prorated over 10 Years 5,840/yr

Total Cost Operation \$6,927/yr

Cost/ gallon =  $\frac{\$6,927}{420 \text{ gal}}$  = \$16.50/gal.

# COST OF SLUDGE DRYING BEDS

## Facility

Excavation - Sludge Drying Beds - 30'x4'x1' = 4.5 cy @ \$4.00/yd = \$18.00

Clay Liner 30' x 4' = 120 '

30 x 1' = 30

30 x 1' = 30

4 x 1' = 4

4 x 1' = 4

180 ' @ 1.00/ ' = \$188.00

Total Cost Facility Approximately \$200

## Operation

### Spread Waste Solvent

Labor 2 men x 2 hr x 2/yr x \$9.00 = \$72.00

Equipment Truck 2 hr x 2/yr x \$.50 = 18.00

Fork Lift 2 hr x 2/yr x \$3.00 = 12.00

\$102.00

### Dry Sludge Removal and Burial

Labor - 2 men x 1 hr x 2/yr x \$9.00 = \$ 36.00

Equipment Truck 1 hr x 2 yr x \$4.50 = 9.00

Front End Loader 1 hr x 24 x \$10.00 = 20.00

\$ 65.00

## Total Cost

Facility over one year 200/1 = \$200.00

Spread 102.00

Dry Sludge Removal 65.00

\$367.00/hr

Cost/gallon = \$367.00/440 gallons = \$0.84/ gallon

## **Attachment 2**

Subject: Safety Appraisal of EG&G Idaho Chemical Disposal Practices

Date: June 1980

Author: The Industrial Hygiene Section, EG&G Idaho, Inc.

Prepared for: EG&G Idaho, Inc.



SAFETY APPRAISAL OF

EG&G IDAHO CHEMICAL  
DISPOSAL PRACTICES

BY

THE INDUSTRIAL HYGIENE SECTION

EG&G IDAHO CHEMICAL DISPOSAL  
PRACTICES

PURPOSE AND SCOPE

- (1) To identify current EG&G standard practices for the disposal of chemicals at the INEL.
- (2) To identify EG&G locations where chemicals are used at the ENEL.

SUMMARY

This appraisal was conducted during the months of May and June, 1980. The chemicals identified in this report are considered to be the ones most used at the INEL. A more detailed listing can be obtained from the Industrial Hygiene files for each area. The recommendations concerning the Hazardous Material Disposal Area (HMDA) are considered to be very important.

## FINDINGS

### CENTRAL FACILITIES AREA

#### CFA-654 Craft Shops

Materials: Cleaning solvents

Disposal: Taken to Fire Department burn pit.

#### CFA-664 & 655 Service Station & Big Shop

Materials: Oil, anti-freeze, battery electrolyte, steam cleaner wastes (detergents), car wash wastes (detergents), degreaser solvents, and parts washer solvents.

Disposal: Used oil is (1) hauled to the waste oil holding tank where it is stored until it is sold for recycling, (2) sent to TAN to be mixed with fuel oil and burned in the boilers, or (3) sent to the Fire Department burn pit.

Used anti-freeze is presently being dumped in with the used oil.

Steam cleaner wastes empty into a sump tank which has a drain line running to a disposal pit south of the Central Facilities area. The sump tank is cleaned periodically. The sludge is disposed of in the CF Landfill.

Used battery electrolyte is dumped down a drain in the battery room. This drain is connected to the steam cleaner sump tank.

Car wash wastes drain into the steam cleaner sump tank.

Liquid wastes from the vapor degreaser are dumped in with the used oil. The sludge is disposed of in the CF Landfill.

Used solvent from the parts washers are dumped into the steam cleaner sump tank.

#### CF-688 & 689

Materials: There are a variety of chemicals used in these facilities. They are separated into the following categories for disposal purposes: (1) Ammonium Hydroxide, (2) Sodium Persulfate, (3) Resist, Developer, (4) Organic Acids, (5) Mineral Acids.

This note:  
"stopped per admin memo  
V&Z 2-1-82 dated 6/27/88  
Steve McCommish April 1995"

Steve McCommish  
April 1995

Disposal: The waste containers consist of polyethylene liners inside metal drums. The drums are labeled on the tops and sides and are stored in a fenced area adjacent to CF-688. Warning signs are posted on the fence and a roof is being constructed over this area. When the drums are full, they are transported to the Hazardous Material Disposal Area (HMDA) for interim storage until they are shipped to Wes-Con for final disposal.

#### TSA

Materials: There is a small amount of solvent waste generated at the copy center.

Disposal: The solvent is sent to the HMDA until it is disposed of.

#### TEST REACTOR AREA

##### TRA-666

Materials: Nitric Acid

Disposal: Cold drain

##### TRA 642 & 645

Materials: Sodium Hydroxide, Chlorine, Sulfuric Acid.

Disposal: Warm waste/pond. - *Substance*

##### TRA-603 Basement

Materials: Hydrofluoric Acid, Aluminum Nitrate, Nitric Acid, Hydrochloric Acid, Sulfuric Acid, 1,1,1,-Trichloroethane, Alcohols, methachlor.

Disposal: Generally down sink and to warm waste.

##### TRA-604 Labs

Materials: Nitric Acid, Flurosulfuric Acid, Sulfuric Acid, Hydrochloric Acid, Hydrofluoric Acid, Sodium Chlorate, Sodium Nitrate, Sulfur Dioxide, Bromine Pentafluoride, Chlorine, Fluorine, and numerous other chemicals.

Disposal: Generally down the sink, and to warm waste.

##### TRA-653

Materials: Sanipro

Disposal: Cold drain

#### TRA-653 Electrical

Materials: SS-25 Solvent, Alcohols, Acetone, Methanol.

Disposal: The solvent is loaded in used oil drums and then sent to CFA. The Alcohols, Acetone, and Methanol are used as cleaning materials. The soaked rags are sent to the CFA Landfill.

#### TRA-641

Materials: Methylene Chloride, Chloroform, Hexane, Methyl Alcohol.

Disposal: Down the sink, and to warm waste.

#### TRA-632 Lab

Materials: Sulfuric Acid, Acetic Acid, Phosphoric Acid, Hydrochloric Acid, Nitric Acid, Methyl Alcohol, Trichloroethane, Sodium Hydroxide.

Disposal: These materials are used in an etching process. The waste is washed down the sink, and to the warm waste.

#### TRA-661 Lab

Materials: Acetone, Nitric Acid, Hydrochloric Acid, Sulfuric Acid, Nitrobenzene, and numerous other chemicals.

Disposal: Down the sink, and to the warm waste.

#### TRA-670 Lab

Materials: Acetone, Acetic Acid, Hydrofluoric Acid, Hydrazine Hydrate, Ammonium Hydroxide, Nitric Acid, Sulfuric Acid, Hydrochloric Acid, Methanol, Hydrogen Peroxide, Carbon Tetrachloride, Benzene, and numerous other chemicals.

Disposal: These materials are sent to the sink, or warm waste, or loop water, and some are sent to the HMDA.

#### TRA-671

Materials: Sulfuric Acid, Slimicide J-12, Betz Inhibitor 546, Betz Deposit Control 430.

Disposal: Secondary water goes to the TRA disposal well.

#### TRA-608

Materials: Sodium Hydroxide, Nitric Acid, Sulfuric Acid.

Disposal: Blown down and drainage goes to the north chemical disposal pond.

#### TRA-645

Materials: Sulfuric Acid, Betz Polynodic 606, Slimicide J-9.

Disposal: Secondary water goes to the TRA disposal well.

#### TRA-661 Labs

Materials: Nitric Acid, Ammonium Hydroxide, Dioctyl Phthalate, and numerous other chemicals.

Disposal: Down the sink, and to the warm waste.

#### TRA-670

Materials: Sodium hydroxide, Nitric Acid, Chlorothene NV, Stoddard Solvent, Mineral Spirits, Alcohols, 1,1,1,-Trichloroethane.

Disposal: The Sodium Hydroxide and Nitric Acid are sent to the warm waste or leaching pond. The rest of the materials are used in the machining process and the excess rags are sent to the CF Landfill.

### TEST AREA NORTH

#### TAN-604

Materials: Banvel, Spike, Bromacil, Pyrethrins, Pramitol, Diazinon, Toluamide, Triazole, 2,4-D, 2,4,5-T, Round Up.

Disposal: These materials are used in insect, soil, or weed treatment. All unused chemicals will be sent to HMDA.

#### TAN-607

Materials: Nitric Acid, Tri-Sodium Phosphate, Propanol, Stoddard Solvent, Chlorine, Sodium Hydroxide, Sulfuric Acid, Glacial Acetic Acid, Zinc Bromide, Acetone, Tri-chloroethylene, Methanol, Cutting Fluids.

Disposal: The above materials are sent to the leaching pond, or Hot Waste, or CFA Landfill, or surplused.

#### WRRTF 641/645

Materials: Amerzine, Sodium Sulfite, Sodium Hydroxide, Sulfuric Acid, Silicone, Di-Sodium Phosphate, Freon 12.

Disposal: Materials are sent to leaching pond or to the HMDA.

LOFT 630/650

Materials: Sulfuric Acid, Boric Acid, Sodium Sulfite, Tri-Sodium Phosphate, Sodium Hydroxide, Sodium Chloride, Di-Sodium Phosphate, Hydrazine.

Disposal: Hot waste, warm waste, and sanitary system.

PBF, SPERT & ARA AREAS

SPERT-613

Materials: Sodium Hydroxide, Methyl Chloroform, Trichloroethane, Nitric Acid, Powdered Aluminum.

Disposal: All items sent to hot waste.

ARA-607, 613, 622, 626, 627

Materials: Nitric Acid, Hydrochloric Acid, Chloroethene, Acetone, Potassium Hydroxide, Sulfuric Acid, Acetic Acid.

Disposal: Materials sent to septic tank and leaching pond.

PBF - T-13

Materials: Alumina, Ammonium Citrate, Sulfamic Acid, Potassium Permanganate, Soda Ash, Sodium Hydroxide, Sodium Sulfite, Trisodium Phosphate, Disodium Phosphate.

Disposal: Items above are used in laboratories. Used materials are sent to holding tank and then to CPP.

PBF-620

Materials: Iodide crystals, Starfomic Indicator, Sulfamic Acid, Sodium, Molybdate Reagent, Stannous Reagent, Phenolphthalein Indicator, Potassium Iodide, Nitric Acid.

Disposal: Above items are sent to holding tank and then to CPP.

PBF-601

Materials: Ammonium Hydroxide, Sulfuric Acid, and Chromates.

Disposal: Items sent to warm waste injection well or holding tank and then to CPP. Chromates are sent to evaporation pond.

## RECOMMENDATIONS

- (1) The HMDA should be under the direction of Waste Management, and not under CF Facilities Services & Maintenance.
- (2) A location should be designated in each area (TAN, TRA, CFA, etc.) as a "HMDA Pick-Up Area". The area should be fenced and should be set up to handle temporary storage. The chemicals or items should be picked up on a monthly basis from each area.
- (3) A new location for the HMDA should be investigated. The present location has the following problems:
  - (a) Access to the area during the winter months is limited.
  - (b) Explosives are known to be buried in the terrain.
  - (c) Access to the area is dependent on the use of the DOE Gun Range.
- (4) Amount of paperwork should be minimized. At the present time, it is easier to pour a small quantity down a sink or dump it out in the desert than complete numerous forms for proper disposal.
- (5) Unwanted chemicals are sometimes included with other items to be excessed. These chemicals then have to be removed and handled separately, since hazardous materials can not be released for public sale. A method for assessing the originating organization for the disposal costs should be established.
- (6) There appears to be a lack of understanding by the operational groups on the proper disposal of chemicals. They should be alerted to follow the standards in the EG&G Safety Manual (Sections 6020, 8010, 11030, 11050), and I.D. Standard Operational Safety Requirements #0550.

## **Attachment 3**

**Subject:** Memo on information related to chromate and boron solutions and morpholine use and disposal at NRF. Morpholine was likely used as solvent at NRF.

**Date:** April 1, 1993

**From:** S. H. McCormick, EG&G Idaho, Inc.

**To:** G. J. Stormberg, EG&G Idaho, Inc.



Memo

From: S.H. McCormick, WAG 4  
To: G.J. Stormberg  
Date: April 1, 1993  
Subject: OU4-12 Work Plan Comment Response

The INWMIS database has entries for chromates, chromate solutions, boron solutions and morpholine having been disposed in Landfill 2. According to the database these wastes were generated at NRF and disposed at the landfill. The date and amounts of disposal are shown below.

**Chromate solutions & chromates**

May 31, 1972	624.6	October 31, 1972	2,914.7
November 30, 1972	15,898.3	February 28, 1973	1,249.1
March 31, 1973	1,249.1	June 30, 1973	2,744.3
		Total	24,680.7

**Boron Solutions**

January 31, 1972	1,760.2	February 29, 1972	567.8
May 31, 1972	5,621.2	Total	7,949.2

**Morpholine**

July 31, 1971	359.6
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Telephone conversations on March 30 and April 1, 1993 with Dolf Sierre of NRF revealed the following information about these wastes. The chromate solutions and chromates refer to chromium which was typically added to the cooling water in the secondary cooling loop of a reactor as a corrosion inhibitor. The solutions would normally not have been radioactively contaminated because would not have come into contact with radioactive materials during normal reactor operations. The concentration of chromium typically ranged from 10 to 14 mg/L according to Dolf. This concentration was also used in the ETR at the Test Reactor Area (taken from *Monitoring, Analysis, and Test Plan TRA-36 ETR Cooling Tower*, EGG-ER-8544, April 1989, W. R. Pigott). According to Mr. Sierre the chromate solutions which were disposed at CFA Landfill II were most likely the result of leaks or spills from the secondary cooling systems. The solutions would have been absorbed onto kitty litter (diatomaceous earth) and rags and put into drums with sealed lids. The drums would have been surveyed or sampled before exiting NRF and if found nonradioactively contaminated disposed at CFA Landfill. The INWMIS data base indicates the chromate solutions were disposed as liquids, however, it is likely that the drums contained the kitty litter and rags which were used to absorb the solution. The drums were probably not completely filled of liquid.

Boron solutions were most likely used for criticality control in a reactor primary cooling loop or in a fuel storage pool. The wastes disposed in the landfills would have been absorbed and placed in sealed drums and handled in the same manner as chromate solutions. Boron solutions could be radiologically contaminated if a leak occurred from the primary cooling loop. The waste boron solutions may also have been generated from a storage tank kept at NRF. The tank held boron solutions awaiting use in a reactor. If a leak from this tank occurred the solution would not have been radiologically contaminated. Dolf did not know the typical concentration of boron solutions used at NRF during that time.

Morpholine was likely used as a solvent (see attached copy from Merc Index).

*See SH McCormick, 4/1/1993*



## **Attachment 4**

**Subject:** Memo of Conversation (Form EG&G-561) on a reference to 120 drums of trichloroethylene potential disposed to CFA Landfill.

**Date:** April 5, 1993

**Interviewer:** S. H. McCormick, EG&G Idaho, Inc.

**Interviewee:** Spencer Smith, ICF Technology Inc., Boston, Mass.



EG&G Idaho, Inc.

Form: EG&G-561

### MEMO OF CONVERSATION

Person Calling: Steve McCormick

Date: April 5, 1993

Representing Org: WAG 4

Time:

Person Called: Spencer Smith

Phone No. 617-348-2432

Representing Company: ICF Technology Inc, Boston

Subject: Innovative Technology Demonstration INEL CFA Landfill II.

I spoke with Spencer about a reference in the report to disposal of 120 drums of trichloroethylene (TCE) in CFA Landfill II.

Spencer worked on this project and was an author on the report. I asked Spencer how the amount and type of waste was determined since there is no reference to this in Industrial Nonradioactive Waste Management Information System (INWMIS). The information was given to ICF during a phone conversation with EG&G personnel (Robert Herd and Shirley Rossin). According to Spencer their estimates were based on estimates of the amounts and types of wastes in the landfill. He was not aware whether their estimates were based on interviews.

Additional Information:

*Steve H. McCormick 4/5/93*



## **Attachment 5**

**Subject:** Memo of Conversation (Form EG&G-561), personnel interview with Dave Dahlquist on past disposal of waste oil, oil filters, solvents, and other shop waste.

**Date:** April 14, 1993

**Interviewer:** S. H. McCormick, EG&G Idaho, Inc.

**Interviewee:** Dave Dahlquist, EG&G Idaho, Inc.



**MEMO OF CONVERSATION**

Person Calling: Steve McCormick

Date: April 14, 1993

Representing Org: WAG 4

Time:

Person Called: Dave Dahlquist

Phone No. 526-2252

Representing Company: CFA Shop, EG&G Idaho, Inc.

Subject: Past disposal practices at CFA Shop.

I spoke with Dave about disposal information in the Industrial Nonradioactive Waste Information System (INWMIS) and past operations at the CFA shops.

Dave was aware of the general types of wastes disposed to CFA Landfills II & III from the CFA shop areas. Much of the waste disposed would have gone into dumpsters or other waste containers that would have been hauled to the landfills for disposal. These waste would have likely been categorized under the trash and sweepings category of the INWMIS database. The list should not be considered to be a complete assessment of wastes disposed from the CFA shop. Wastes: brake linings, tires, scrap metal (aluminum, steel and other), cables, wheels, insulation, glass, ballasts from light fixtures, light tubes, batteries, pesticides, plastic, oil filters, empty drums & containers, empty spray cans.

Dave indicated the filters would have included the large type from diesel engines and smaller filters from cars and pickup trucks. The oil filters would have been disposed without being crushed or drained in a 4 cu yd dumpster directly to the ground.

Dave indicated that the sump sludge delivered to the landfill would have come out of the sumps shown on the figure attached (taken from the Motor Pool Pond RI report). These sumps were cleaned periodically and the wastes disposed to the landfill. The sump sludge may have been disposed in a container or directly to the ground. The sumps, which are below floor concrete containers, retain solids, oil, grease, and other materials before they are carried by the sewage system to the CFA sewage plant.

We discussed the types of solvents used in the CFA shops. 111 Trichlorethane was used in a parts washer which discharged to the sump and sewage system. Dave also mentioned other types of solvents such as carburetor cleaners.

**Additional Information:**

Dave now is the environmental coordinator for the CFA shop area. When he took this position in 1989 he began a program to track wastes and eliminate hazardous materials from the operations. A process waste assessment (PWA) is attached which details hazardous materials eliminated from the shop during the past few years. The wastes described in the PWA may indicate types of wastes disposed in the landfills from 1970 to 1984.

*Steve McCormick 4/14/93*

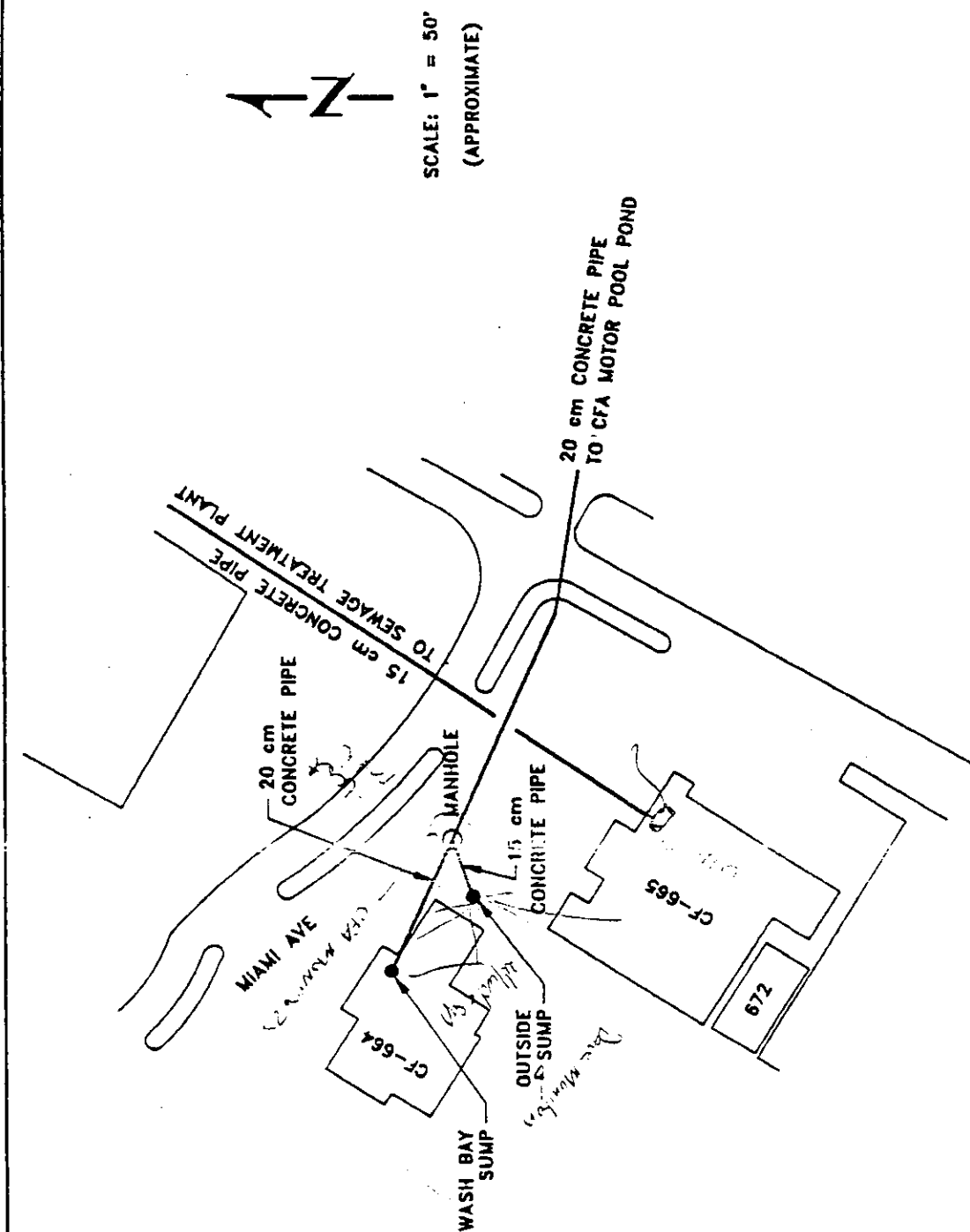


Figure 1-3. CF-664 waste sumps and piping leading to the CFA Motor Pool Pond.